

## CLAIMS

1. A method of making a low-loss electromagnetic wave resonator structure comprising:
  - providing a resonator structure, said resonator structure including a confining device and a surrounding medium, said resonator structure supporting at least one resonant mode, said resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-field radiation pattern away from said confining device, said surrounding medium supporting at least one radiation channel into which said resonant mode can couple; and
  - specifically configuring said resonator structure to reduce or eliminate radiation loss from said resonant mode into at least one of said radiation channels, while keeping the characteristics of the near-field pattern substantially unchanged.
2. The method of claim 1, wherein said step of configuring comprises a modification of said far-field pattern.
3. The method of claim 1, wherein said step of configuring comprises a modification of the geometry or refractive index of said confining device.
4. The method of claim 3, wherein said modification has at least one plane of symmetry.
5. The method of claim 3, wherein said modification has no plane of symmetry.
6. The method of claim 1, wherein said step of configuring comprises an introduction of at least one nodal plane into said far-field pattern.

- 1           7. The method of claim 1, wherein said confining device operates using index  
2   confinement effects, photonic crystal band gap effects, or a combination of both.
- 1           8. The method of claim 1, wherein said surrounding medium is homogeneous.
- 1           9. The method of claim 1, wherein said surrounding medium is inhomogeneous.
- 1           10. The method of claim 1, wherein said radiation channels comprise superpositions of  
2   at least one spherical wave.
- 1           11. The method of claim 1, wherein said radiation channels comprise superpositions of  
2   at least one cylindrical wave.
- 1           12. The method of claim 1, wherein said confining device comprises a waveguide with  
2   a grating where said grating contains at least one defect.
- 1           13. The method of claim 12, wherein said step of configuring comprises modifying the  
2   dielectric constant of the grating.
- 1           14. The method of claim 12, wherein said step of configuring comprises modification  
2   of the local phase shift.
- 1           15. The method of claim 1, wherein said confining device comprises a waveguide  
2   microcavity.
- 1           16. The method of claim 1, wherein said confining device comprises a photonic crystal  
2   slab.

1 17. The method of claim 1, wherein said confining device comprises a disk resonator.

1 18. The method of claim 1, wherein said confining device comprises a ring resonator.

1 19. A method of making a low-loss electromagnetic wave resonator structure  
2 comprising:

3 providing a resonator structure, said resonator structure including a confining device  
4 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
5 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
6 field radiation pattern away from said confining device, said surrounding medium supporting at  
7 least one radiation channel into which said resonant mode can couple; and

8 specifically configuring said resonator structure to increase radiation loss from said  
9 resonant mode into at least one of said radiation channels, while keeping the characteristics of  
10 the near-field pattern substantially unchanged.

1 20. The method of claim 19, wherein said radiation channel comprises of one or more  
2 spatial directions.

1 21. A method of making a low-loss acoustic wave resonator structure comprising:

2 providing a resonator structure, said resonator structure including a confining device  
3 and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4 resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5 field radiation pattern away from said confining device, said surrounding medium supporting at  
6 least one radiation channel into which said resonant mode can couple; and

specifically configuring said resonator structure to reduce or eliminate radiation loss from said resonant mode into at least one of said radiation channels, while keeping the characteristics of the near-field pattern substantially unchanged.

22. A method of designing a low-loss electronic wave resonator structure comprising: providing a resonator structure, said resonator structure including a confining device and a surrounding medium, said resonator structure supporting at least one resonant mode, said resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-field radiation pattern away from said confining device, said surrounding medium supporting at least one radiation channel into which said resonant mode can couple; and

specifically configuring said resonator structure to reduce or eliminate radiation loss from said resonant mode into at least one of said radiation channels, while keeping the characteristics of the near-field pattern substantially unchanged.

23. A method of making a low-loss acoustic wave resonator structure comprising: providing a resonator structure, said resonator structure including a confining device and a surrounding medium, said resonator structure supporting at least one resonant mode, said resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-field radiation pattern away from said confining device, said surrounding medium supporting at least one radiation channel into which said resonant mode can couple; and

specifically configuring said resonator structure to increase radiation loss from said resonant mode into at least one of said radiation channels, while keeping the characteristics of the near-field pattern substantially unchanged.

1           24.    The method of claim 23, wherein said radiation channel comprises of one or  
2   more spatial directions.

1           25.  A method of making a low-loss electronic wave resonator structure comprising:  
2           providing a resonator structure, said resonator structure including a confining device  
3   and a surrounding medium, said resonator structure supporting at least one resonant mode, said  
4   resonant mode displaying a near-field pattern in the vicinity of said confining device and a far-  
5   field radiation pattern away from said confining device, said surrounding medium supporting at  
6   least one radiation channel into which said resonant mode can couple; and

7           specifically configuring said resonator structure to increase radiation loss from said  
8   resonant mode into at least one of said radiation channels, while keeping the characteristics of  
9   the near-field pattern substantially unchanged.

1           26.  The method of claim 25, wherein said radiation channel comprises of one or more  
2   spatial directions.

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